thereto, the nanoparticles of the core probe being bound to each other as a result of the hybridization of some of the oligonucleotides attached to them.

In yet another embodiment, the kit comprises a substrate having attached to it at least one pair of electrodes with oligonucleotides attached to the substrate between the electrodes. The oligonucleotides have a sequence complementary to a first portion of the sequence of a nucleic acid to be detected.

The invention also provides the satellite probe, an aggregate probe and a core probe.

The invention further provides a substrate having nanoparticles attached thereto. The nanoparticles may have oligonucleotides attached thereto which have a sequence complementary to the sequence of a first portion of a nucleic acid.

The invention also provides a metallic or semiconductor nanoparticle having oligonucleotides attached thereto. The oligonucleotides are labeled with fluorescent molecules at the ends not attached to the nanoparticle.

The invention further provides a method of nanofabrication. The method comprises providing at least one type of linking oligonucleotide having a selected sequence, the sequence of each type of linking oligonucleotide having at least two portions. The method further comprises providing one or more types of nanoparticles having oligonucleotides attached thereto, the oligonucleotides on each type of nanoparticles having a sequence complementary to a portion of the sequence of a linking oligonucleotide. The linking oligonucleotides and nanoparticles are contacted under conditions effective to allow hybridization of the oligonucleotides on the nanoparticles to the linking oligonucleotides so that a desired nanomaterials or nanostructure is formed.

The invention provides another method of nanofabrication. This method comprises providing at least two types of nanoparticles having oligonucleotides attached thereto. The oligonucleotides on the first type of nanoparticles have a sequence complementary to that of the oligonucleotides on the second type of nanoparticles. The oligonucleotides on the second type of nanoparticles have a sequence complementary to that of the oligonucleotides on the first type of nanoparticle-oligonucleotide conjugates. The first and second types of

nanoparticles are contacted under conditions effective to allow hybridization of the oligonucleotides on the nanoparticles to each other so that a desired nanomaterials or nanostructure is formed.

The invention further provides nanomaterials or nanostructures composed of nanoparticles having oligonucleotides attached thereto, the nanoparticles being held together by oligonucleotide connectors.

The invention also provides a composition comprising at least two types of nanoparticles having oligonucleotides attached thereto. The oligonucleotides on the first type of nanoparticles have a sequence complementary to the sequence of a first portion of a nucleic acid or a linking oligonucleotide. The oligonucleotides on the second type of nanoparticles have a sequence complementary to the sequence of a second portion of the nucleic acid or linking oligonucleotide.

The invention further provides an assembly of containers comprising a first container holding nanoparticles having oligonucleotides attached thereto, and a second container holding nanoparticles having oligonucleotides attached thereto. The oligonucleotides attached to the nanoparticles in the first container have a sequence complementary to that of the oligonucleotides attached to the nanoparticles in the second container. The oligonucleotides attached to the nanoparticles in the second container have a sequence complementary to that of the oligonucleotides attached to the nanoparticles in the first container.

The invention also provides a nanoparticle having a plurality of different oligonucleotides attached to it.

The invention further provides a method of separating a selected nucleic acid having at least two portions from other nucleic acids. The method comprises providing one or more types of nanoparticles having oligonucleotides attached thereto, the oligonucleotides on each of the types of nanoparticles having a sequence complementary to the sequence of one of the portions of the selected nucleic acid. The selected nucleic acid and other nucleic acids are contacted with the nanoparticles under conditions effective to allow hybridization of the

oligonucleotides on the nanoparticles with the selected nucleic acid so that the nanoparticles hybridized to the selected nucleic acid aggregate and precipitate.

In addition, the invention provides methods of making unique nanoparticle-oligonucleotide conjugates. The first such method comprises binding oligonucleotides to charged nanoparticles to produce stable nanoparticle-oligonucleotide conjugates. To do so, oligonucleotides having covalently bound thereto a moiety comprising a functional group which can bind to the nanoparticles are contacted with the nanoparticles in water for a time sufficient to allow at least some of the oligonucleotides to bind to the nanoparticles by means of the functional groups. Next, at least one salt is added to the water to form a salt solution. The ionic strength of the salt solution must be sufficient to overcome at least partially the electrostatic repulsion of the oligonucleotides from each other and, either the electrostatic attraction of the negatively-charged oligonucleotides for positively-charged nanoparticles, or the electrostatic repulsion of the negatively-charged oligonucleotides from negatively-charged nanoparticles. After adding the salt, the oligonucleotides and nanoparticles are incubated in the salt solution for an additional period of time sufficient to allow sufficient additional oligonucleotides to bind to the nanoparticles to produce the stable nanoparticle-oligonucleotide conjugates. The invention also includes the stable nanoparticle-oligonucleotide conjugates, methods of using the conjugates to detect and separate nucleic acids, kits comprising the conjugates, methods of nanofabrication using the conjugates, and nanomaterials and nanostructures comprising the conjugates.

The invention provides another method of binding oligonucleotides to nanoparticles to produce nanoparticle-oligonucleotide conjugates. The method comprises providing oligonucleotides, the oligonucleotides comprising a type of recognition oligonucleotides and a type of diluent oligonucleotides. The oligonucleotides and the nanoparticles are contacted under conditions effective to allow at least some of each of the types of oligonucleotides to bind to the nanoparticles to produce the conjugates. The invention also includes the nanoparticle-oligonucleotide conjugates produced by this method, methods of using the conjugates to detect and separate nucleic acids, kits comprising the conjugates, methods of